

Safety Culture Assessment in the Air Traffic Control Sector

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Abstract

Air traffic control (ATC) is an important profession that directly affects the performance of flight operations in the air and on the ground. The fluctuating number of incidents and accidents in the aviation sector is as a result of various factors, in which safety culture is a vital factor in establishing the overall safety in aviation. This research aims to assess individual perceptions and judgments of safety culture in practical contexts utilizing nine aspects of safety culture (Work situation, Learning, Communication, Risk perception, Attitude toward safety, Justness, Safety-related behaviors, Flexibility and Reporting). The safety culture was assessed using observations, questionnaire packages and interviews. This study pertains to the ATC staff in Mitiga International Airport, Tripoli, Libya. A number of 25 samples of the suggested questionnaires were collected, along with a numeral of interviews. Assessment of the nine aspects were found to function well with good reliability (internal consistency) with (α) value above 0.8. A five-point Likert Scale was used. Assessment with gained results of mean, standard deviation and variance showed medium average scores in the nine aspects. An individual characteristic such as experience was found to have very little effect on how the safety culture aspects were perceived and judged.

Keywords

Safety culture, Mitiga International Airport, ATC, air traffic control, aviation risk management

1- Introduction

Air traffic controllers (ATC) are people trained to maintain the safe, orderly and expeditious flow of air traffic in the global ATC system. The position of air traffic controllers is one that requires highly specialized knowledge, skills, and abilities. Controllers apply separation rules to keep aircrafts at a safe distance from each other in their area of responsibility and move all aircraft safely and efficiently through their assigned sector of airspace, as well as on the ground. Due to the fact that controllers have an incredibly large responsibility while on duty and make countless real-time decisions on a daily basis, the ATC profession is consistently regarded around the world as one of the most mentally challenging careers, and can be notoriously stressful depending on many variables (equipment, configurations, weather, traffic volume, human factors, etc.) However, recently, several studies shined a light on the importance of the risk management in the aviation sector Elkhweldi and Elabrouk (2015).

The aim of this research is to assess individual perceptions and judgments of safety culture in practical contexts utilizing nine aspects of safety culture along with their related questions (Work situation, Learning, Communication, Risk perception, Attitude toward safety, Justness, Safety-related behaviors, Flexibility and Reporting). The safety culture was assessed using observations, questionnaire packages and interviews. This study pertains to the ATC staff in Mitiga International Airport located in Tripoli, Libya. A number of 25 samples of the suggested questionnaires were collected, along with a number of interviews which had been conducted with managers and staff. In this research, the study sample was nominated from the control tower of Mitiga airport. The age range of the respondents from 26 to 56, the experience range varied between 2 to 31 years. However, upon the examination of the gathered data the revealed results could prove to be useful in upgrading the current level of safety culture and consequently developing the overall safety structure. Assessing safety culture in the ATC sector can show whether there is a positive culture or negative culture in the ATC sector. Since safety culture affects the overall safety of the ATC profession, so there is a good chance to improve safety through upgrading safety culture aspects that may be useful for the appraisal of the

organization's overall safety that affects aviation business management. It also aims to contribute in the development of methods of safety culture assessment that can support continuous improvement processes for safety in an organization.

2- Safety Culture

Many high reliability industries around the world are showing an interest in the concept of 'safety culture', as a way of reducing the potential for large-scale disasters. Organizations have certain characteristics which can be referred to as its 'culture'. These are generally invisible to those within the company, and yet quite transparent to those from a different culture. Safety culture is a sub-set of organizational culture which has been described as: 'who and what we are, what we find important, and how we go about doing things around here'. There are some questions that we may ask such as, is there a safety information system that collects, analyses and disseminates information from incidents and near misses, as well as from regular proactive checks on the system; has a reporting culture where people are prepared to report their errors, mistakes and violations; has a culture of trust where people are encouraged and even rewarded to provide essential safety-related information. Asa and Roland (2007) noted that there is not a generally agreed upon definition of safety culture. However, most investigators agree that a safety culture includes elements such as good communication, organizational learning, senior management commitment to safety, and a working environment that rewards the identification of safety issues. A combination of good organizational learning, reporting, justness, and flexibility is emphasized. In a learning culture, there exists both the will and competence to learn from experience and the readiness to implement improvements. In a just culture there are just consequences following the reporting of an incident or anomaly. This can enhance the willingness to forward information about work and safety, which is a fundamental feature of a reporting culture and a proactive approach to safety. Flexibility in an organization concerning the ability to transform the work organization to manage changing demands, for example, in periods of high workload. It also comprises respect for individuals' skills and experiences.

3- Methodology

The required data was gathered using voluntary questionnaires in which the responder's identity was completely anonymous. Interviews had taken place with managers and staff to discuss more ideas and to better understand the general responses of the respondents. Visits were also done to watch and note the layout of the places and environments of the study. Communications and discussions with the employees responsible for the safety and quality department took place, where there was a good chance to have information about registered safety records, which provided additional information about the types of safety procedures, that were already in place, as well as what safety errors, hazards and risks were noted and how they were managed and mitigated. In the assessment of safety culture in the study presented here, each of the nine aspects says or describes something about safety culture; the aspect could be about the effects of a safety culture or could be a prerequisite for the existence of a safety culture. The nine aspects are not necessarily independent or uncorrelated, but they are easy to use in practical settings (Guldenmund, 2000). These aspects provide a valuable and practically useful view of a safety culture within organizations. In order to study the issue at the operational level for selected organization staff, data was gathered on nine aspects concerning (work situation, flexibility, communication, justness, safety-related behaviors, attitude towards safety, risk perception, learning and reporting). A survey was conducted using a questionnaire designed around a Likert Scale to quantify the degree to which reflects a positive culture or negative culture if applicable. The Likert Scale used was assigned with five degrees (Strongly disagree, Disagree, No opinion, Agree, Strongly Agree). The sensitive nature of the information gathered for this study made the anonymous survey a good instrument for this purpose.

4- Data Collection and Analysis

The first part of the questionnaire package contains questions about the profession, experience period and organization name of the study samples. Reference to gained results, it is found that the nine scales representing the nine safety culture aspects found to function well (with a good level of measurement reliability) in the ATC sector study samples settings, and may constitute valuable methods for monitoring and improving safety culture aspects in working environments. The questionnaire and interview methods have strengths and weaknesses (as do most other methods). It is noted that questionnaires are often criticized as a researcher tool because of the problem with distorted answers by responders, i.e. answers that are not truthful; there can be many reasons for these distortions.

An instance could be that the responder simply does not know the answer to a question and therefore guesses, or another could be that the responder would like to make a good impression. For example, it has questions about behaviors and attitudes towards safety of both the individual responder and of work colleagues in the organization.

Instead of answering honestly, the responder may answer the way he believes to be socially desirable. The responder can be disappointed with themselves for having a particular attitude, or feels they are letting the work colleagues down by responding honestly. It is believed that the responders' answers are generally honest in the studies presented. However, comments during interviews with the staff revealed existing problems concerning trust in key persons, and lack of anonymity when writing a report. The staff was aware of the importance of reporting deficiencies in technical equipment and therefore gave responses that were in line with what was socially desirable within the ramp division. These findings illustrate the value of obtaining questionnaire data. The reliability of interview data can be affected by various sources of error, some of which can be attributed to the subject and some to the interviewer. The basic components in the questionnaires are the questions and their design. Great effort was made to make the questions as clear and understandable as possible. Both emotionally charged wording and leading questions were avoided. This increases the chances of obtaining reliable answers from the responders. Samples of questionnaire were submitted to selected responders to have their answers and their comments. Several trials were made to correct and improve the questionnaire questions to the final shape.

5- Assessing the Nine Safety Culture Aspects (Scales) Editing Service

Using SPSS (Statistical Package for the Social Sciences) software is essential in assessing the number of items and it is used in this dissertation to analyze and assess safety culture aspects (Ashgate and Aldershot, 2008).

Reliability (internal consistency)

The internal consistency (reliability) of the nine safety culture aspects (scales) in the questionnaire packages were assessed using Cronbach's alpha coefficient, the Cronbach's coefficient alpha test (α) of each scale demonstrated acceptable internal consistency and reliability for the ATC sector in Table 1. Noticeable values of alpha coefficient showed values above 0.8 which show indication that there was internal consistency.

Table (1) Internal Consistency (Cronbach's Alpha Coefficient)

The nine safety culture aspects	Cronbach's Alpha coefficient (α)
work situation	0.861
Flexibility	0.860
normal Communication in work	0.856
Justness	0.859
related behaviors Safety	0.860
towards safety Attitudes	0.858
perception Risk	0.859
Learning	0.861
Reporting	0.860
Average	0.859

Normality

An assessment of the normality of data using SPSS software is a prerequisite for many statistical tests as normal data is an underlying assumption in parametric testing. There are two main methods of assessing normality - numerically and graphically. Table 2 presents the normality test results for the ATC sector questionnaire data. Comparing between the two well-known tests of normality namely the Kolmogorov-Smirnov test and the Shapiro-Wilk test, the Shapiro-Wilk W test is more appropriate for small sample sizes less than 2000 participants. For this reason, we will use the Shapiro-Wilk test as our numerical means of assessing normality. Using normality test hypotheses where assuming (h_0) as the observed distribution fits the normal distribution and (h_a) as the observed distribution does not fit the normal distribution. So, if we accept (h_0), we accept the assumption of normality, otherwise we have the alternative assumption (h_a) which indicate the non-normality of tested data.

The Shapiro-Wilk (W) is insignificant if the variable's distribution is not different from normal, $W=1$ when our sample-variables data are perfectly normal (perfect h_0) and when W is significantly smaller than 1 presents non-normal (h_a) is accepted. Table 2 shows that the value of Sig. (probabilities) is less than 0.05 (the typical alpha level), so we reject h_0 , this data is significantly different from normal, so we accept the alternative (h_a) in which data is not normally distributed. As the sample size increases, normality parameters become more restrictive and it becomes harder to declare that the data is normally distributed. Accordingly, we can check normality of the data using nonparametric test, Table 3 which shows the analysis using non-parametric normality (Chi-Square) test for the ATC sector. This test illustrates the rejection of the first hypothesis (h_0) and accepts the alternative hypothesis (h_a) of non-normality of the tested data.

Table (2) Tests of Normality of safety culture aspects variables

Statement	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Do you like your job?	0.349	25	0.000	0.561	25	0.000
Do you experience that the knowledge and experiences of all employees are appreciated?	0.270	25	0.000	0.862	25	0.003
Do you receive the information you need to be able to carry out your job in a safe manner?	0.277	25	0.000	0.869	25	0.004
Do you think it is accepted that sometimes you make a mistake in your work?	0.284	25	0.000	0.822	25	0.001
Do you experience that you generally talk about how the work can be improved in order to lead to increased safety?	0.347	25	0.000	0.794	25	0.000
Do you think the management is working for good safety?	0.223	25	0.002	0.844	25	0.001
Do you think the work is carried out in a safe manner?	0.199	25	0.012	0.855	25	0.002
Do you think you got enough training for your current job?	0.400	25	0.000	0.694	25	0.000
Can you report any misuse that affect safety?	0.449	25	0.000	0.565	25	0.000

Table (3) Non-parametric normality One-Sample Chi-Square Test

	Null Hypothesis	Test	Sig.	Decision
1	The categories of Do you like your job? occur with equal probabilities.	One-Sample Chi-Square Test	.001	Reject the null hypothesis.
2	The categories of Do you experience that the knowledge and experiences of all employees are appreciated? occur with equal probabilities.	One-Sample Chi-Square Test	.178	Retain the null hypothesis.
3	The categories of Do you receive the information you need to be able to carry out your job in a safe manner? occur with equal probabilities.	One-Sample Chi-Square Test	.010	Reject the null hypothesis.
4	The categories of Do you think it is accepted that sometimes you make a mistake in your work? occur with equal probabilities.	One-Sample Chi-Square Test	.058	Retain the null hypothesis.
5	The categories of Do you experience that you generally talk about how the work can be improved in order to lead to increased safety? occur with equal probabilities.	One-Sample Chi-Square Test	.004	Reject the null hypothesis.
6	The categories of Do you think the management is working for good safety? occur with equal probabilities.	One-Sample Chi-Square Test	.102	Retain the null hypothesis.
7	The categories of Do you think the work is carried out in a safe manner? occur with equal probabilities.	One-Sample Chi-Square Test	.102	Retain the null hypothesis.
8	The categories of Do you think you got enough training for your current job? occur with equal probabilities.	One-Sample Chi-Square Test	.000	Reject the null hypothesis.
9	The categories defined by Can you report any misuse that affect safety? = Strongly Agree and Agree occur with probabilities 0.5 and 0.5.	One-Sample Binomial Test	.043 ¹	Reject the null hypothesis.

Normality of data can be tested graphically as illustrated below. In order to determine normality graphically we can use the output of a normal Q-Q Plot Figure (1), Figure (2), Figure (3) and Figure (4). If the data is normally distributed then the data points will be close to the diagonal line. If the data points stray from the line in an obvious non-linear fashion then the data is not normally distributed. As we can see from the normal Q-Q plot below the data is non-normally distributed.

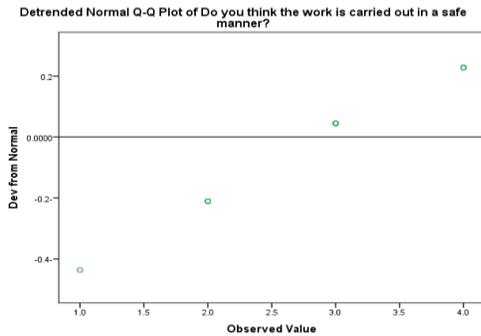


Figure (1) illustrates non-normality of data

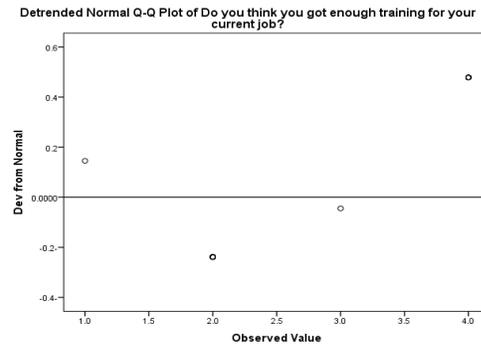


Figure (2) illustrates non-normality of data

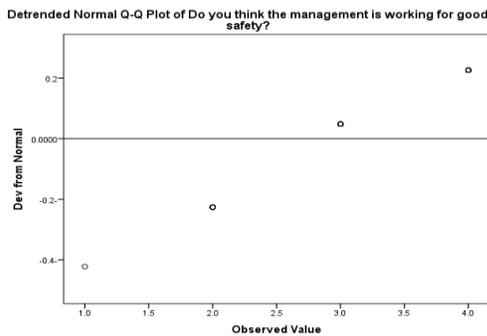


Figure (3) illustrates non-normality of data

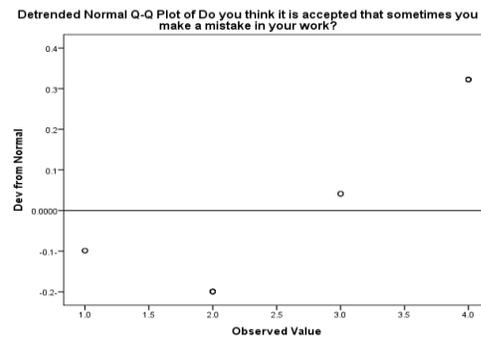


Figure (4) illustrates non-normality of data

6- Finding frequencies, probable means and percentages

It is very important to clarify and explain using the five-point Likert Scale, especially because it is pivotal in assessing our data (Lee, 1998). Since the variables that express the choices are (strongly agree, agree, no opinion, disagree and strongly disagree) are all ordinal scales and the numbers correspond to them are the weights as follows (strongly agree = 5, agree = 4, no opinion = 3, disagree = 2 and strongly disagree = 1). Then, we calculate the mathematical average (Probable Means) by calculating the length of the period and in our case is a result of dividing 4 by 5 where number 4 express number of distances (1 to 2 is the first distance, 2 to 3 is the second distance, 3 to 4 is the third distance and 4 to 5 is the fourth distance) and number 5 expresses number of choices. When dividing 4 by 5, we gain the length of period which equals 0.8, the distribution is illustrates in Table 4.

Table (4) illustrate grades of probable mean

Level	Probable Mean
Strongly disagree	1 to 1.79
Disagree	1.80 to 2.59
Neutral	2.60 to 3.39
Agree	3.40 to 4.19
Strongly agree	4.20 to 5

From the questionnaire data and as previously mentioned, using the SPSS software, we calculated the frequencies, mean, standard deviation and variance for the purpose of assessing and comparing the variables listed in the safety culture aspects items. Results for the safety culture aspects considered the calculation of the percentage of “negative responses” by merging the alternatives 1-2, while “positive responses” represented the alternatives 4-5 from the five-point scoring Likert Scale as seen in Table 4. In the opinion of study researcher, if 30% or more of the respondents give a negative response on an item, this was considered as reflecting a problem in the safety culture.

7- Assessing safety culture aspects

Reviewing the data analysis of the mean, standard deviation and variance of the safety culture of the nine aspects indicated in Table 5 for the ATC sector illustrates the differences regarding the safety culture aspects within each of the nine-safety culture aspect and they are as follow:

1) Work Situation safety culture aspect

The responses of the study samples in a working environment shows that the average probable Mean = 3.53. Whereby some respondents experienced low levels of cooperation within their organization and some of them did not like their work. On the other hand, more than 80% of the respondents found that enough training was provide to perform their jobs in a safe manner. Negative responses shown in the working situation were respondents feeling stressed and more than 70% said that they did not receive support from their supervisors. In contrast, more that 80% confirm getting support from their co-workers.

2) Flexibility safety culture aspect

The responses of the study samples in a working environment shows that the average probable Mean = 2.72. The study shows that the item "When a problem arises, is it the most knowledgeable person who gets to solve it?" has a remarkable positive response with a percentage of 70. Another positive response for the item "Is it acceptable to make suggestions for change concerning somebody else's area of responsibility?" has a percentage of more than 55. In contrast the study highlights negative response in the items "From your experience, is the knowledge and experience of all employees appreciated?" with a percentage of more than 55 %.

3) Communication in normal work safety culture aspect

The responses of the study samples in a working environment shows that the average probable Mean = 3.05. The study reveals that the items "Do you receive clear instructions from your foreman/supervisor?" and "Is it clear who you should contact to discuss questions of safety?" has a remarkable positive response with a percentage of more than 70%. Another positive response for the item "Good communication is an essential mechanism in fostering a better safety culture." has a percentage of more than 60 %. In contrast, the study highlights negative response in the items "Do you think you have received sufficient training in how communication should work in Emergency situations?" and "Do you think enough information is collected to check if machines/technical equipment are functioning?" with a percentage more than 50 %. On the other hand, the study highlights positive response of items "Is it clear who you should contact to discuss questions of safety?" and " Are you satisfied with how you are informed about safety issues that affect your job?" have percentage of more than 50%. The average probable mean for the item communication in normal work is 3.05 with standard deviation equals to 0.98 and reference to Table 4 which shows Likert Scale probable mean values and comparing with it. This confirm the Mean value 3.05 is located in neutral level, i.e. the safety culture aspect of communication in normal work's direction has an aspect direction of 0.39 while Likert Scale probable mean values and neither positive nor negative.

4) Justness safety culture aspect

The responses of the study samples in a working environment shows that the average probable Mean = 2.92 in Table 5. In this study we found that the items; "Do you think it is accepted that sometimes you make a mistake in your work?", "If you have reported something concerning the aircraft safety/air safety (orally or in writing), do you feel measures are taken within reasonable time?", "Do you think you and your co-workers are fairly judged when something goes wrong on the job?", "Do those who do not perform their work in a safe manner receive attention for this?", and " Do you think that you and your co-workers receive praise for calling attention to deficiencies in safety?" has a remarkable negative response with a percentage of more than 40 percent. In contrast, the study highlights positive responses in the items; "Do you think it has been made clear were the line is drawn for acceptable and unacceptable behavior at work?" and "Do you talk about near-misses that occur on the job (i.e. events that could have led to damage to an aircraft or flight safety?" with a percentage more than 50%.

5) *Safety-related behaviors safety culture aspect*

The responses of the study samples in a working environment shows that the average probable Mean=2.72 in Table 5. The study found that the items "Do you think it is accepted that sometimes you make a mistake in your work?", "If you have reported something concerning the aircraft safety/air safety (orally or in writing), do you feel measures are taken within reasonable time?", "Do you think you and your co-workers are fairly judged when something goes wrong on the job?", "Do those who do not perform their work in a safe manner receive attention for this?", and "Do you think that you and your co-workers receive praise for calling attention to deficiencies in safety?" has a remarkable negative response with a percentage of more than 40 percent. In contrast, the study highlights positive responses in the items "Do you think it has been made clear where the line is drawn for acceptable and unacceptable behavior at work?" and "Do you talk about near-misses that occur on the job (i.e. events that could have led to damage to an aircraft or flight safety?" with a percentage more than 50 percent.

6) *Attitudes towards safety culture aspect*

The responses of the study samples in a working environment shows that the average probable Mean=3.18 in Table 5. The study found that the items "Do you think the middle management is working towards good safety?" and "Do you think safety exercises are useful/valuable?" has a remarkably positive response with a percentage of more than 40 percent. In contrast, the study highlights a negative response in the items "Do you think the management is working for good safety?" and "Do you think the management finds education and training important?" with a percentage more than 40 percent.

7) *Risk perception safety culture aspect*

The responses of the study samples in a working environment shows that the average probable Mean=3.63 in Table 5. The study found that the items "Do you think all the others at your work have good care toward safety to?" "Do you think there is need to encourage the others take steps toward safety?," "Do you think your colleagues think of safety seriously?" and "Can you feel a hazard before it may become risk?" have a remarkably positive response with a percentage of more than 55 percent. In contrast, the study found negative response in the item "Do you think the work is carried out in a safe manner?" with a percentage reach to 32% (Reason, 1997).

8) *Learning safety culture aspect*

The responses of the study samples in a working environment shows that the average probable Mean = 3.11 in Table 5. The study found that the items "Do have a chance to talk about your needs of training with the management?", "Do you wish to have more safety training in specific subjects?" and "Do you like what training materials that the management provides you with?" has a remarkable positive response with a percentage of more than 40 percent. In contrast the study highlights negative responses to the items "Do you think you got enough training for your current job?", "Do you think the management is taking good care of the training of the employees?" and "Do you think the provided training is good enough to handle the physical job?" with a percentage more than 60% (Hudson, 2001).

9) *Reporting safety culture aspect*

The responses of the study samples in a working environment shows that the average probable Mean = 4.22 in Table 5. The study found that the items "Can you report any misuse that affect safety?", "Is it acceptable to you that somebody reports about your safety related mistake?" and "Does the management appreciate safety related problems reporting?" has a remarkable positive response with a percentage of more than 80 percent. In contrast, the study highlights a negative response in the item "Is it acceptable within your work society to report safety related mistakes?" with a percentage more than 45% (Antonsen, 2009).

8- Testing the study hypotheses using one sample T-test

First main hypothesis (Null Hypothesis- h_0): this hypothesis assumes that there is positive safety culture amongst the study samples ATC staff sector.

Second main hypothesis (Alternative Hypothesis- h_a): this hypothesis assumes that there is negative safety culture amongst the study samples of ATC staff sector.

The third hypothesis is to compare the mean of the answers of the ATC respondents with the probable mean of the Likert scale in Table 4 utilizing one sample T test where the comparable value of mean is 3.4 which correspond to "Agree" response in the guided Likert scale Table 4. Reference to Table 4, Table 5 and Table 6 the T-test failed to reveal a statistically reliable difference between the average mean number of the nine safety culture aspects Table 5

which equals to 3.08 and the guided Mean number of Likert Scale Table 4 which equals ($M = 3.4$). In addition, the T -test illustrates in Table 6 that most values of significance (Sig.) are at less than 0.05. These results revealed that the first hypothesis (Null Hypothesis h_0) failed to be ascertained and the alternative hypothesis (h_a) is true which specify that the safety culture of the ATC sector is in the level of negative safety culture.

Table (5) Mean, Standard Deviation and Variance

Safety culture aspects related to ATC Sector	Mean	St. Deviation	Variance	Rank	Level
Safety culture aspect no.1-Work Situation	3.53	0.62	0.44	3	Agree
Safety culture aspect no.2-Felexibilty	2.72	0.96	0.98	9	Neutral
Safety culture aspect no. 3-Communication in normal work	3.05	0.98	0.97	6	Neutral
Safety culture aspect no. 4-Justness	2.92	0.92	0.86	7	Neutral
Safety culture aspect no. 5- Safety related behavior	2.74	0.89	0.81	8	Neutral
Safety culture aspect no. 6- Attitudes towards safety	3.18	0.91	0.86	4	Neutral
Safety culture aspect no. 7- Risk perception	3.63	0.85	0.79	2	Agree
Safety culture aspect no. 8-Learning	3.11	0.97	1.00	5	Neutral
Safety culture aspect no.9 -Reporting	4.22	0.53	0.36	1	Agree

Table (6) One-Sample T test

	Test Value = 3.4					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Do you get well cooperation from your co-workers?	3.031	21	0.006	0.645	0.203	1.088
When a problem arises, is it the most knowledgeable person who gets to solve it?	-2.883	21	0.009	-0.627	-1.080	-0.175
Does the information you need on the job come at the proper time?	-10.580	21	0.000	-1.264	-1.512	-1.015
Do you think you and your co-workers are fairly judged when something goes wrong on the job?	-3.965	21	0.001	-0.855	-1.303	-0.406

9- Conclusion

Since the safety culture was studied using observations, questionnaire packages, interviews, and collection of facts, the nine scales representing the nine safety culture aspects were found to function well (with a good level of measurement reliability) in the ATC sector settings. The questionnaire packages allowed an establishment of reference data concerning safety culture aspects in the ATC sector. Likewise, the interviews provided knowledge and examples of positive and negative expressions of safety culture that the interviewees had experienced.

The comparisons of average scores for safety culture aspects showed that the ATC sector generally had the lower average scores. An individual characteristic such as experience was found to have very little effect on how the safety culture aspects were perceived and judged. It was found that the learning processes are not as proficient. The communication was not considered by most of respondents to function well. A negative concern was found in the training on how communication should function in an emergency situation. Respondents think that communication functions well during change of shift (e.g. information at hand over). Some negative responses were noticed that it is

not clear who they should contact to discuss questions of safety. They agreed that there is not much information that they receive about incidents and accidents. Reporting in ATC sector is showing better in this aspect.

10- Recommendation

Further research in safety culture should concentrate on:

- Developing methods for assessing the behavioral and situational areas of safety culture.
- Testing the relations of safety culture to safety management.
- Determining which aspects and items are important for the measurement of safety culture. For instance, in order to reduce the questionnaire package to an essential minimum, question such as, what elements influence safety behaviors, and how they exert this influence are imperative to finding the key indicators.
- Culture measurement stage to an improvement stage is an essential and big issue that make it very important to concentrate and take quick and serious actions to expedite having the required suitable changes, from the other hand share lessons gained from previous different safety culture practices.
- It is recommended that, more research is conducted in relation to pilots, maintenance staff and airport handling staff to have a full and complete idea about safety culture in addition to having more knowledge to facilitate the improvement of the aviation sector aligning it with that of the fast-pace advancements existing in the field of aviation.

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Biography



Mansour Elkhweldi is a senior aeronautical engineer, specialized in safety management, aviation engineering with 33 years' experience in aviation. He received his Master degree of Engineering Management from School of Applied Science and Engineering, The Libyan Academy, Tripoli-Libya. And he had earned his Bachelor degree of Aeronautical Engineering from Faculty of Engineering of University of Tripoli.



Saber Kh. Elmabrouk received his Ph.D. degree in reservoir and oilfield management from the University of Regina, Saskatchewan, Canada. He earned his Master's and Bachelor's degrees in Petroleum Engineering from the University of Tripoli, Libya. Dr. Saber is currently a faculty member at the School of Applied Science and Engineering, The Libyan Academy, Tripoli, Libya. He teaches graduate courses in both Petroleum Engineering department and Engineering Management department. His research interests include uncertainty analysis and risk management, modeling, optimization, big data analysis, artificial intelligence, and oilfield management. His research experience and teaching career spans twenty-five years.



Ashour Sassi is the head of the meteorology and aviation safety department at the Technical College of Civil Aviation and Meteorology with more than 30 years of experience. He works as a research scientist and lecturer in the field of meteorology and environment. He received his master degree from the University of Saskatchewan, Canada. His main areas of expertise are turbulence, composition of the middle and upper atmosphere, ozone destruction in the stratosphere, and its relationship with atmospheric global circulation and space weather. The current focus of his research is aviation safety.